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Free convection of hybrid Al2O3-Cu water nanofluid in a differentially heated porous cavity
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Abstract
Hybrid nanofluids are a new type of enhanced working fluids, engineered with enhanced thermo-physical properties. The hybrid nanofluids profit from the thermo-physical properties of more than one type of nanoparticles. The present study aims to address the free convective heat transfer of the Al2O3-Cu water hybrid nanofluid in a cavity filled with a porous medium. Two types of important porous media, glass ball and aluminum metal foam, are considered for the porous matrix. The experimental data show dramatic enhancement in the thermal conductivity and dynamic viscosity of the synthesized hybrid nanofluids, and hence, these thermophysical properties could not be modeled using available models of nanofluids. Thus, the actual available experimental data for the thermal conductivity and the dynamic viscosity of hybrid nanofluids are directly utilized in the present theoretical study. Various comparison with results published previously in the literature are performed and the results are found to be in excellent agreement. In most cases, the average Nusselt number Nul is decreasing function of the volume fraction of nanoparticles. The results show the reduction of heat transfer using nanoparticles in porous media. The observed reduction of the heat transfer rate is much higher for hybrid nanofluid compared to the single nanofluid. © 2017 The Society of Powder Technology Japan

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